

REMARKS

Claims 1, 4, 12, 15, 19, 23, 27, 30, 34, 38, 42, 50, 56, 67, and 186 are amended, no claims are canceled, and no claims are added; as a result, claims 1-7, 12-77, and 186-189 remain pending in this application.

§103 Rejection of the Claims

Claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Havemann *et al.* (U.S. 6,358,849 B1) in view of Brown *et al.* (U.S. 6,168,704 B1).

As amended: claim 1 recites, "wherein the selected areas are directly on a top surface of the insulator," claims 4, 12, and 38 recite, "wherein the unused areas are directly on a top surface of the oxide layer," claims 15, 19, 56, and 67 recite, "wherein the selected areas are directly on a top surface of the oxide layer," claim 23 recites, "wherein the selected areas or the unused areas are directly on a top surface of the oxide layer," claims 27 and 34 recite, "wherein the selected areas are directly on a top surface of the polymer layer," claim 30 recites, "wherein the selected areas or the unused areas are directly on a top surface of the polymer layer," and claim 186 recites, "wherein the selected areas are directly on a top surface of the different insulator layer."

The Office Action admits in several places, for example on page 2, that Havemann *et al.* does not disclose removing the barrier layer and the seed layer from selected areas of the insulation. Applicant agrees. Further, Brown *et al.* at column 6, lines 14-21, states, "The barrier metal and copper seed layers 400A and 400B may be blanket-deposited in the opening 405 and on top of a patterned photomask 407 (shown in phantom in FIG. 4A) that was used to form the opening 405 in the first place. When the patterned photomask is subsequently removed, the portions of the barrier metal and copper seed layers 400A and 400B overlying the patterned photomask 407 are also removed, leaving the barrier metal and copper seed layers 400A and 400B selectively formed only in the opening 405." (emphasis added) In Brown *et al.*, even after removal of the photomask, the dielectric material 410 is still covered by conductive layer 415, and therefore any areas where the barrier metal layer 400A and the copper seed layer 400B are removed could not be directly on a top surface of the dielectric material 410. Hence, Brown *et*

al. fails to teach or suggest the elements of claims 1, 4, 12, 15, 19, 23, 27, 30, 34, 38, 56, 67, and 186 as quoted above.

Thus, neither Havermann *et al.* nor Brown *et al.*, either alone or in combination, teach or suggest each of the elements of claims 1, 4, 12, 15, 19, 23, 27, 30, 34, 38, 56, 67, and 186.

Therefore, the Office Action fails to state a *prima facie* case of obviousness with respect to these claims, and so the Applicant respectfully requests withdrawal of the rejection and reconsideration and allowance of claims 1, 4, 12, 15, 19, 23, 27, 30, 34, 38, 56, 67, and 186.

Claims 2-3, 5-7, 13-14, 16-17, 20-21, 24-25, 28-29, 31-32, 35-36, 39-41, 57-66, 68-77, and 187-189 are dependent on claims 1, 4, 12, 15, 19, 23, 27, 30, 34, 38, 56, 67, and 186 respectively. For reasons analogous to those stated above and elements in the claims, Applicant submits that the Office Action fails to state a *prima facie* case of obviousness with respect to these claims, and therefore respectfully requests withdrawal of the rejections and reconsideration and allowance of claims 2-3, 5-7, 13-14, 16-17, 20-21, 24-25, 28-29, 31-32, 35-36, 39-41, 57-66, 68-77, and 187-189.

Further, the fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); MPEP § 2143.01. (emphasis added) The Office Action repeatedly, for example on page 5, relies on Brown *et al.* at page 16, lines 42-67 and column 17, lines 1-24 to provide the required suggestion for the desirability to combine Brown *et al.* with Havermann *et al.* The Office Action on page 5 states,

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove the barrier layer and the seed layer from selected areas and to deposit the conductor by a selective deposition process only in those areas left after the removal of the barrier layer and the seed layer in the invention of Havermann *et al.* for the disclosed intended purpose of Brown *et al.* of reducing the manufacturing cost, reducing consumption of electroplating solution and CMP consumables, reducing the amount of post-metallization deposition CMP needed and reducing the amount of hazardous effluents as disclosed by Brown *et al.* in col. 16, lines 42-67 and col. 17, lines 1-24. (emphasis added)

As noted in the Applicant's previous response (responding to the Office Action mailed July 30, 2004), any saving that might be taught or suggested to by Brown *et al.* (while Applicant does not admit it to be so) relate to the selective deposition of the copper layer, and are not related "to remove the barrier layer and the seed layer from [sic] selected areas" as recited in the Office

Action. Further, the cited portion of Brown *et al.* in part states at column 17, lines 17-22 that, "Finally, in any of the above-disclosed embodiments of a method for selectively electrochemically depositing copper according to the present invention, it is not necessary to etch the barrier or seed layers, which can be extremely difficult and time consuming." (emphasis added) Thus, the statement on page 5 of the Office Action, "to remove the barrier and seed layer form [sic] selected areas and to deposit the conductor . . . " in support of the combination of Havermann *et al.* and Brown *et al.* is directly contradicted by the disclosure in Brown *et al.*

Further, Havermann *et al.* is concerned with CMP processing having manufacturability problems (see column 1, lines 50-51) and at column 3, lines 42-49 states,

(10) Remove the portion of copper and TiN barrier outside of the interconnect trenches by CMP; the CMP also planarizes any bumpiness in the plated copper. Initially use a hard pad to planarize, and then follow with a soft pad. ARC 126 acts as a CMP polish stop; copper polishes faster than the silicon oxynitride. The remaining copper forms interconnects 160; see FIG. 1g.

Thus, Havermann *et al.* removes the copper and TiN outside of the interconnect trenches by CMP as a way of planarizing any bumpiness in the plated copper, and therefore the method of Brown *et al.* of selective deposition of the copper destroys the stated purpose of Havermann *et al.*, that being elimination of manufacturability problems by the use of CMP on copper outside the interconnect trenches. Because the statements in the Office Action in support of the combination of Havermann *et al.* and Brown *et al.* are not supported by the documents themselves, the Office Action fails to state a *prima facie* case of obviousness with respect to claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189

In addition, the Office Action repeatedly, for example on page 7, states or makes statement to the effect that,

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the depth of the trench, thus varying the depth to which the barrier layer is deposited as there is no statement denoting the criticality of the depth to which the barrier layer is deposited.

Further the Office Action repeatedly, for example on page 9-10, states or makes statements to the effect that,

Furthermore, it would have been within the scope of one of ordinary skill in the art at the time the invention was made that gold may be used as an

alternative to copper or aluminum although copper is preferred over gold, and as Brown *et al.* discloses that the use of gold has been considered in semiconductor interconnections and disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments.

Further, on pages 12-13, the Office Action recites,

Furthermore, it would have been within the scope of one of ordinary skill in the art at the time the invention was made that silver may be used as an alternative to copper or aluminum although copper is preferred over silver, and as Brown *et al.* discloses that the use of gold has been considered in semiconductor interconnections and disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments.

Applicant disagrees with each of the above or similar statements made throughout the Office Action, and Applicant further submits that these statements are unsupported by the references and therefore are within the personal knowledge of the Examiner. Therefore, Applicant requests that the Examiner provide an affidavit as required by MPEP § 2144.03. If the Examiner can not provide an affidavit, Applicant requests withdrawal of the rejections and reconsideration and allowance of claims whose rejections are based on these statements.

For at least the reasons stated above, Applicant respectfully requests withdrawal of the rejection and reconsideration and allowance of claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189.

Claims 42-44 and 50-55 and Claims 18, 22, 26, 33, and 37

Claims 42-44 and 50-55 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Havemann *et al.* (U.S. 6,358,849 B1) in view of Brown *et al.* (U.S. 6,168,704 B1) and Ting *et al.* Further, claims 18, 22, 26, 33, and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Havemann *et al.* in view of Brown *et al.* as applied to claims 1-7, 12-17, 19-21, 23-35, 27-32, 34-36, 38-41, 56-77 above, and further in view of Ting *et al.*

Again, Applicant has proceeded under the assumption that the document cited as "Ting *et al.*" in the Office Action refers to U.S. Patent No. 5,969,422. Applicant respectfully notes that there is a "Ting, C. H." as co-author of a document which was included in an Information Disclosure Statement mailed November 16, 1999 in connection with this matter. If the Applicant's assumption in using U.S. Patent No. 5,969,422 is incorrect, Applicant respectfully

requests that the next official communication clarify which document is being cited, and allow Applicant the opportunity to respond to that cited document.

As amended, claims 42 and 50 recite, "wherein the selected areas are directly on a top surface of the oxide layer." Claims 43-44 and 51-55 depend from claims 42 and 50 respectively, and therefore include all the elements recited in the claim from which they depend. For reasons analogous to those argued above with regards to claims 1-7, 12-17, 19-21, 23-25, 27-32, 34-36, 38-41, 56-77, and 186-189, neither Havermann *et al.* nor Brown *et al.* teach or suggest these elements of claims 42 and 50 as quoted above. The Office Action does not rely on, and fails to point out in Ting *et al.*, any teaching or suggestion of these elements missing in Havermann *et al.* and Brown *et al.* as recited in claims 42 and 50. Thus, neither Havermann *et al.*, nor Brown *et al.*, nor Ting *et al.*, either alone or in combination, teach or suggest all of the elements in claims 42-44 and 50-55.

Further, claims 18, 22, 26, 33, and 37 depend from claims 15, 19, 23, 30, and 34 respectively and therefore include all the elements recited in the claim from which they depend. As argued above with regards to claims 15, 19, 23, 30, and 34, neither Havermann *et al.* nor Brown *et al.* teach or suggest all of the elements as recited in claims 15, 19, 23, 30, and 34, and so fail to teach or suggest all of the elements in claims 18, 22, 26, 33, and 37. The Office Action does not rely on, and fails to point out in Ting *et al.*, any teaching or suggestion of these elements missing in Havermann *et al.* and Brown *et al.* as recite in claims 15, 19, 23, 30, and 34. Thus, neither Havermann *et al.*, nor Brown *et al.*, nor Ting *et al.*, either alone or in combination, teach or suggest all of the elements in claims 18, 22, 26, 33, and 37.

In addition, the Office Action does not provide any additional motive for combining Havermann *et al.* with Brown *et al.* with regards to claims 18, 22, 26, 33, 37, 42-44, and 50-55. Thus, for the reasons argued above, the Office Action has failed to state a *prima facie* case of obviousness with respect to claims 18, 22, 26, 33, 37, 42-44, and 50-55 because the Office Action fails to show a suggestion for the desirability to combine the referenced of Havermann *et al.*, Brown *et al.*, and Ting *et al.* that is supported in the prior art.

For at least the reasons stated above, Applicant respectfully requests withdrawal of the rejections and reconsideration and allowance of claims 18, 22, 26 33, 37, 42-44, and 50-55.

Allowable Subject Matter

Applicant acknowledges the allowance of claims 45-49.

Reservation of Rights

Applicant does not admit that references cited under 35 U.S.C. §§ 102(a), 102(e), 103/102(a), or 103/102(e) are prior art, and reserves the right to swear behind them at a later date. Arguments presented to distinguish such references should not be construed as admissions that the references are prior art.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

PAUL A. FARRAR

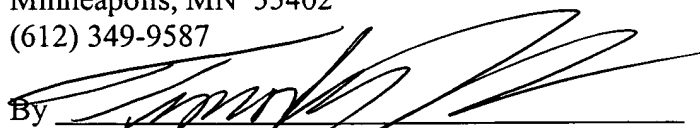
By his Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. Box 2938
Minneapolis, MN 55402
(612) 349-9587

Date

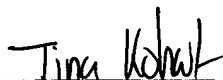
22 June '05

By


Timothy B. Clise
Reg. No. 40,957

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